ON THE REPLACEMENT OF A LOST VEIN IN CONNECTION WITH A STRIDULATING ORGAN IN A NEW AGARISTID MOTH FROM MADAGASCAR, WITH DESCRIPTIONS OF TWO NEW GENERA.

By DR. KARL JORDAN.

(With text-figs. 1–9.)

IN the most generalised Lepidoptera the wing-neuration agrees closely with the tracheae of the pupal wing. This tracheal system remains of an ancestral type in all Lepidoptera, but in the specialised families no tubular vein is formed along some of the main tracheae, which become atrophied before emergence of the imago, and are indicated in the fully developed wing by folds. With the exception of some generalised groups—such as *Cossidae* and *Castniidae*, for instance—the stem of the radial vein is a fold in the cell, distally divided, and the upper submedian SM^1 (= 1c of Herrich-Schäffer) is absent as a tubular vein from the majority of families of Lepidoptera.

It holds generally good that the direction of development, which is constant in one group of families, reappears sporadically also in other groups, be it the loss of an ancestral organ or the acquirement of a specialisation. We find, for instance, a clavate antenna, a specialisation, not only in all butterflies, but here and there also among moths; the foretibial epiphysis, an ancestral organ, is absent from nearly all families of butterflies and has also been lost by some moths, for example, by all Chalcosiids and some Saturniids and Sphingids. The loss of the same organ in widely different groups, however, is much more frequent than the acquirement of one and the same specialisation, and is of quite common occurrence, as exemplified by the mouth-parts of Lepidoptera, the ocelli, legs, genitalia, etc. It is, therefore, not surprising that the ancestral vein SM^1 (= 1c) is found absent in some genera of families which in the aggregate are characterised by the retention of that vein, f.i. in some *Zygaenidae* (s.l.) and *Castniidae* (s.l.). On the other hand, it is most remarkable that this vein is constantly absent from so many families of Lepidoptera. Considering the two facts: (1) that the generalised tracheal system persists in the chrysalides of these families, the framework on which to build up any of the generalised veins therefore being still given; and (2) that the wing pattern is influenced by the submedian fold SM^1 as if it were a vein, one might be inclined to regard the pupal trachea SM^1 as a potential vein, and to expect that the discarded vein SM^1 would make its reappearance here and there. But that is not the case; the potentiality is gone, being, in this instance, an *a priori* conception without reality. The absence of vein SM^1 has, in the majority of the families, the regularity of a natural law, and if it is a law, and not a mere rule, it admits of no exceptions.

If considered from this point of view, the species of Agaristid which forms the main subject of this paper acquires a general interest. It is a new species from Madagascar, representing a new genus. We have only a single ♂, the chief

structural features of which are the large club of the thin antenna and a stridulating organ. It is the latter which claims our attention first.

The males of a number of Agaristids and Noctuids make a fairly loud noise during flight. The sound, which carries a good distance, is produced by the

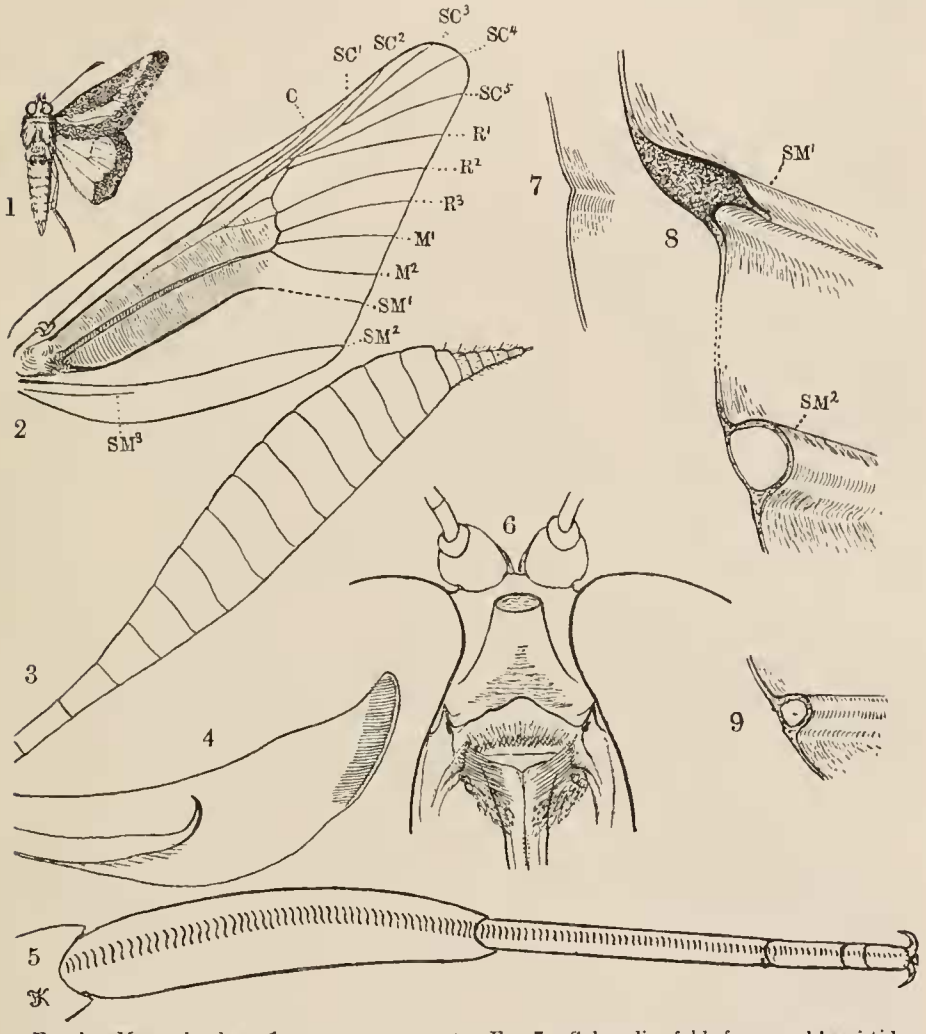

FIG. 1.—*Musurgina lacta* ♂.
„ 2.—Ditto; underside of forewing.
„ 3.— „ ; club of antenna.
„ 4.— „ ; clasper.
„ 5.— „ ; hindtarsus.
„ 6.— „ ; oral area and frons.

FIG. 7.—Submedian fold of a normal Agaristid.
„ 8.— „ „ (SM¹) and submedian vein SM² of *Musurgina*.
„ 9.— „ vein of a *Zygaena*

friction of a tarsus against a modified portion of a wing. In the Malagassic species, which we will describe below as *Musurgina laeta* (text-fig. 1), the musical apparatus is composed of the forewing an the hindtarsus.

On the underside of the forewing *Musurgina* bears a naked area occupying

the cell except its upper angle, and extending backwards to the submedian fold. This area is transversely ribbed (text-fig. 2); the ribs are rounded-convex, and correspond to the interspaces of the rows of scales on the rest of the wing. Along the costal side of the median vein a stripe of scaling is left, protected by the vein. The space behind the cell is concave beneath and correspondingly convex on the upperside of the wing, and is sharply bounded by the submedian fold. Now, in other *Agaristidae* the wing does not show any appreciable incrassation at the fold in a transverse section (text-fig. 7), while in *Musurgina* the place of the fold is occupied by a conspicuous ridge, which extends as far distad as the stridulating area and then fades away into an ordinary non-incrassate fold (text-figs. 2 and 8). Under a weak lens the ridge has the appearance of a vein, but on closer examination is found to differ very considerably from the tubular veins. The ridge is not cylindrical and not hollow, and much more chitin has been employed to construct it than in the case of a tubular vein (text-fig. 8). The stridulation area is thus strongly supported, but this end could have been achieved much more economically by the construction of a tubular vein similar to SM^2 (= 1b; text-fig. 8). The factors of growth which govern the development of the stridulation organ in *Musurgina* are unable to reproduce the lost vein and can only direct matter to the line where support is needed, and build up a substitute. The vein is a memory, and its actuality cannot be regained. For comparison we add a figure of the transverse section of SM^1 of a *Zygaena* (text-fig. 9), in which genus this vein is thinner than the other veins, and evidently is on the road towards obliteration.

The naked membrane expanding between the subcostal nervure and the submedian ridge acts as a sound-board, the sound itself being produced by the friction of the hindtarsus on the median nervure. This vein, which is curved, with the convexity towards the costa (text-fig. 2), as is the submedian ridge distally, is enlarged within the naked area, and bears 60-odd obliquely transverse, sharp ridges which are directed costad-distad. The ridges are strongest in the proximal half of the vein and gradually become fainter towards the apex of the cell, the most distal ones being shifted to the costal side of the vein.

The corresponding structure of the hindtarsus is found on the upperside slightly towards the inside, a file of transverse ridges extending from the base of the tarsus to the apex (text-fig. 5). The first segment is inflated and bears about 55 ridges. The hindtarsus as well as the tibia is smooth-scaled, which is an evident advantage for the good working of the instrument. It will be noticed in text-fig. 8 that the false submedian vein is narrow along its highest point, a longitudinal ridge being formed which, I think, is likewise employed in the production of the sound when the tarsus strikes across it. This ridge recalls the stridulation organ of the Australian Agaristid, *Platagarista tetrapleura* Meyr. (1891), in which the instrument is composed of the hindwing and hindtarsus, the subcostal vein being provided with a ridge (but not with a file) and the hindtarsus with a file. Compare also what we say of *Pemphigostola* Strand (1909) on p. 72.

We do not know what sound *Musurgina* produces, but assume that it is similar to the sound of *Platagarista*, a hybrid noise between whistling and hissing.

Further characteristics of *Musurgina* may be gathered from the following description of the genus and species and the figures illustrating it.

Musurgina gen. nov.

♂. Frons in middle a little more than one-third as broad as the eye is high ; frontal process (text-fig. 6) long, conical, flattened above and below, truncate, apical area marginate, transverse, more rounded ventrally than dorsally. Oral edge of frons sharp, triangular, with the apex rounded off ; at each side a pointed pyramidal genal process. Scape of antenna very broad, its diameter about one-fifth shorter than that of the centre of the frons. Shaft of 30-odd segments, very slender, lengths of segments VI to XII more than twice their widths in centre ; club (text-fig. 3) composed of 12 or 13 segments, very large, slightly flattened, five times as broad as the shaft, rather abruptly narrowing distally to form a short, thin, slightly upcurved, apical hook of 5 or 6 segments, the last of which bears a thin, conical, truncate, apical stylet ; upperside of antenna scaled, the club proximally also beneath ; underside of shaft covered with short hair and bearing bristles like typical Agaristids. Eye naked. Palpus beneath rough-hairy inclusive of third segment, which is less than three times as long as apically broad, and but slightly porrect. Pronotum at base with very large scales contiguous to head ; rest of thorax with hair mixed with long narrow scales. At base of abdomen a divided tuft of scales, the longest of which are dark, metallic, oar-shaped, or lanceolate (the other segments of abdomen almost entirely denuded in our specimen). Tibiae without spines ; tibia and first tarsal rough-hairy in foreleg, with some long hair on upperside in midleg, smooth and inflated in hindleg ; inner spur of midtibia reaching a little beyond one-third of first tarsal segment ; proximal spurs of hindtibia quite short, much shorter than the tibia is broad, and the apex of the longer (inner) spur about twice the length of the spur distant from the apical spurs, inner apical spur twice the length of the outer one and about one-fourth as long as the first tarsal segment. Hindtarsus from base to apex with naked dorsal stripe of transverse, slightly obliquely curved ridges (text-fig. 5), segment I with spines at apex only, II without spines at base ; V with a few spines in hindtarsus and only bristles in fore- and midtarsus ; proportional lengths of hindtarsal segments 90, 70, 17, 5, 9, segment IV being shorter than broad. Claw with tooth in middle.

Neuration.—Forewing (text-fig. 2) : SC^1 off cell at two-thirds, areole small, SC^3 from areole, SC^3 and SC^4 on long stalk, SC^5 from this stalk near areole ; R^1 from upper cell-angle close to areole ; R^2, R^3, M^1, and M^2 almost at equal distances from each other around lower cell-angle, which is rounded, M^2 being much more distal than in allied genera ; M curved with the convexity towards costa ; SM^1 a false vein as far as the stridulating organ extends (to near lower cell-angle) and nearly curved like M, distally a mere fold as in other Agaristidae ; SM^3 thin, distally approaching SM^2, but not joining it, i.e. SM^2 not " forked " at base.—— Hindwing : SC^2 and R^1 from upper cell-angle, which is almost 90°, R^2 from middle, R^3 and M^1 from lower cell-angle, which is acute, M^2 from near angle.

Genotype : *M. laeta* spec. nov.

Musurgina laeta spec. nov. (text-fig. 1).

♂. Head and thorax russet mixed with grey. Scaling of antenna white. Frontal process black. Palpus orange, third segment with some black hairs. Tegula black at apex. Abdomen much rubbed, evidently orange, basal tuft with

the long curved scales metallic black. Coxae and femora pale fawn colour, some of the long hair almost white; tibiae and tarsi of fore- and midlegs black densely mixed with white; inner side of foretibia and two spots on outer side orange; hindtibia and greater part of hindtarsus I pale buff, rest of tarsus blackish above, grey beneath.

Upperside of forewing russet; costal margin excurved from base to beyond middle and again near apex, termen very oblique, tornus very obtuse, the angle almost effaced, hindmargin strongly rounded; a silvery white stripe runs from base of costal margin obliquely across cell, continues distad as far as the stridulation area extends and then turns costad across lower angle of cell, reaching costal margin 2 to 3 mm. from apex, the stripe 2 mm. broad below cell, 1 mm. towards costa; costal edge brown from base beyond middle, cell except apex and part of terminal area shaded with brown, termen partly mixed with white and bearing a row of rufous dots placed between the veins; fringe a mixture of white and sepia-coloured scales.——Hindwing orange, with a sepia-black terminal band 2 to 3 mm. wide, ending at anal angle, extending along costal margin to near middle, slightly dentate upon M^2 and SM^2; termen ventricose above centre, excurved at submedian fold, this lobe having a rufous marginal bar, two small rufous dots between R^3 and M^2 and vestiges of two more dots farther apicad; fringe white and sepia, some white scaling at margin in black band, especially in front of submedian lobe.

Underside sepia colour, rufous marginal markings vestigial; forewing without white stripe, a stripe on the submedian false vein as far as lower cell-angle, and connected across lower cell-angle with a triangular spot placed a short distance outside the discocellulars pale orange buff, this stripe fading away towards inner margin.——Hindwing as above.

Genitalia: Anal tergite as in the allied genera a long, tapering, curved process ending with a sharp point. Clasper long, narrow, ventral margin evenly excurved, dorsal margin incurved, apex pointed, ventral apical margin with a regular row of nearly 40 stiff bristles lying flat above the inner surface of the clasper and being directed dorsad-frontad; harpe an evenly curved, sharply pointed, spiniform process (text-fig. 4).

Length of forewing: 18·5 mm.; breadth: 7·5 mm.

Hab. Diego Suarez, N.E. Madagascar, 24.xii.1916 (Gaston Melou); 1 ♂.

The unknown ♀ may be expected to differ from the ♂ in the stridulating organ being absent, the submedian fold not inerassate, the antennal club less enlarged, the hindleg normal, and the forewing broader.

When we first saw this insect we believed it to be a species of *Pemphigostola* Strand (1909), a genus placed by its author among the Castniids. *Pemphigostola synemonistis*, of which only one ♂ is known, occurs like *Musurgina laeta* on Madagascar. It has practically the same size as *M. laeta*; the forewing is very narrow, with the costal margin excurved proximally and before apex, and bears a stridulating organ, and the hindwing has a small submedian lobe, as in *Musurgina*. According to Strand's detailed description *Pemphigostola*, however, differs very essentially from *Musurgina* in SM^1 (= 1c) being a tubular vein in both wings, in the frons being broader, the forewing having no areole, both cell-angles of the hindwing being 90°, in the midtarsus (not hindtarsus) bearing a stripe of transverse ridges (the file), and in other details. The colouring is also different from that of *M. laeta*.

This *Pemphigostola* is a strange insect. The statements that in the hindwing the cross-veins are complete, vein 5 arises from their centre, and the costal vein branches off from the middle of the subcostal are very remarkable, placing *Pemphigostola* quite outside the Castniids. The stridulating organ also is something unknown among Castniids; in fact, I was under the impression that a stridulating organ of this kind (wing plus tarsus) does not occur outside the Noctuiform families of Lepidoptera. If *Pemphigostola* really is allied to the Castniids, which I do not believe, the similarity between it and *Musurgina* in the peculiar antennae, the stridulating organs, the size and shape of the wings is astounding, and if *Pemphigostola* should prove to be an Agaristid, the presence of a tubular vein SM^1 (= Ic) in fore- and hindwing would be no less wonderful. However, it seems to me desirable that *Pemphigostola* be re-examined.

The general colouring of *Musurgina laeta* agrees very well with that of some other Agaristids, especially with the Malagassic species described by Saalmüller as *Ovios laminifera* (*Ber. Senck. Ges.* 1878, p. 91), and figured by him in *Lepid. Madag.* 1884 as *Euscirrhopterus laminifer* (p. 140, no. 327, tab. 8, fig. 133). Hampson, who had not seen the species, placed it in *Paratuerta* among the Noctuids (*Lep. Phalaenae*, ix. p. 415 [1910]). We have a ♂ of this *laminifera*, and find that the species is a true Agaristid, representing a new genus allied to *Aegocera*.

Ancarista gen. nov.

♂. Frons very narrow, widening above and below, its diameter at the narrowest point about twice that of the shaft of the antenna; frontal process conical, somewhat flattened above, not quite so long as the frons is broad at this point, truncate, the apical surface marginate, transverse, more rounded above than below. Oral edge of frons sharp, laterally curving upwards to join the short genal process. Palpus similar to that of *Aegocera*, segments I and II long-hairy beneath; III short-scaled, the scales longer at apex, therefore the segment appearing more strongly club-shaped than it really is. Eye large. Antenna simple, long (16 mm.), extending much beyond apex of cell, slightly but distinctly thickened from about three-fifths to four-fifths, then gradually becoming thinner, the distal segments being much thinner than the shaft. Bristles and hair on ventral surface as in true Agaristids. Thorax clothed with a mixture of scales and hairs, scales of patagia especially large, widest at apices, which are rotundate-truncate and multidentate. Abdominal tergite I with bifid tuft of long scales and hairs, the lateral scales curving inward. Tibiae without spines as in *Mitrophrys*, fore- and midtibiae with long hair-scales on upperside, hindtibia almost smooth; inner spurs of mid- and hindtibiae more than twice the lengths of outer ones and fully two-thirds as long as tarsal segment I. Tarsi long, more than half as long again as tibiae, spined beneath only, V slightly shorter than IV.

Neuration.——Forewing nearly as in *Mitrophrys*, SC^1 more proximal than M^3, areole long, SC^2 from before apex of areole, SC^3 and SC^4 on long stalk, SC^5 from this stalk close to apex of areole, R^1 from upper cell-angle, which is very acute and is much more distal than lower cell-angle, R^2 and M^1 at equal distances from cell-angle, D^4 longer than the cell is broad at apex.——Hindwing: SC^2 and R^1 from upper cell-angle, R^2 from middle of cell-apex, R^3 and M^1 close together from lower cell-angle, M^2 a short distance below angle, both cell-angles a little

less than 90°. Abdomen with anal tuft. Clasper long, rounded at apex, on inside densely studded with stiff spines which are curved frontad.

♀. Frons broader, antenna thinner.

Genotype: Species identified as *Ovios laminifera* Saalm. (1878).

Differs from *Aegocera* in the long and slender antennae, long tarsi, non-spined tibiae, etc.; and from *Mitrophrys* in the longer antennae and tarsi, longer tibial spurs, much more acute and more projecting upper cell-angle of the forewing, and the narrow frons of the ♂.

Our ♂ has a silver streak on the forewing like the ♀ figured by Saalmüller, but differs from that figure in bearing a broad creamy-white longitudinal stripe which reaches the costal margin at the base and before the apex, and is posteriorly bounded by the silver streak. Moreover, the terminal band of the hindwing is paler, less definite, and anteriorly narrower, and the thin orange admarginal line within this band extends forward to near apex.